Title: “**Miniaturized concentrator arrays as compact angle transformers for light collection and distribution**”

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Abstract (max. 250 words):

Efficient light management is one of the key issues in modern energy conversion systems might it be to collect optical power or to redistribute light generated by high power light emitting diodes. One problem maintains: the final size of the elements if high quality of light management is needed. We propose a novel scheme by using miniaturized angle transformers or concentrators that have size of several millimeters. In this size range diffraction effects play rarely a role and the design can be based on classical ray tracing. Dimensions are chosen to allow effective solution for high power light emitting diodes as well as solar cells.

In most solar cell designs, the photocurrent is extracted through a conducting window layer in combination with a silver grid at the front of the device. The trade-off between series resistance and shadowing requires either buried contacts or screen printing of narrow lines with high aspect ratio. We propose an alternate approach where an array of parabolic concentrators directs the incoming light into the cell. The front metallization can thus be extended over the area between the paraboloids without shadowing loss.

High power light emitting diodes are source with certain far field distribution and composed often out of several chips. Applying the concentrator array technology not on the whole source but locally on each chip promises small and effective solutions.

We demonstrate realization if linear and hexagonal array of micro-concentration systems, discuss details of application and results of simulation of their optical properties in applications.

100 words summary:

Figure: Brass mold and replicated CPC array made of transparent PDMS. (a) shows a hexagonal array of 3D CPCs and (b) shows an array of 2D CPCs. The CPCs are designed for acceptance angles of 24° and are truncated to a length of 5mm. The width of the entry aperture is 3.4mmand the width of the exit aperture is 1mm.